World Journal of Pharmaceutical Sciences
ISSN (Print): 2321-3310; ISSN (Online): 2321-3086
Published by Atom and Cell Publishers
Available online at: http://www.wjpsonline.org/
Review Article

A comprehensive review on Meliaceae family

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Received: 06-07-2015 / Revised: 15-07-2015 / Accepted: 24-07-2015

ABSTRACT

The study deals with review on Medicinal plant family- Meliaceae. This is also called as Mahogany family, is a family of flowering plants consisting of trees, shrubs. Present Review covers 25 important genus and important species in respective genus. Trees of the genus Swietenia and Entandrophragma, commonly called mahogany, and of the genus Cedrela (especially the cigar-box cedar, C. odorata) are economically important timber trees. A few members of Meliaceae have edible fruits. Lansium domesticum (langsat) and Sandoricum koetjape (santol) are popular species. The principal chemical constituents are limonoids and terpenoids as major. Besides this alkaloids flavanoids, coumarins, chromones, lignans and phenolic compounds are also present in major quantity. The drugs of this family majorly used as cytotoxic activity and antimicrobial activity, insect anti-feedant anti-malarial activity.

Key Words: Meliaceae, cytotoxic, *Azadirachta indica*, limonoids, Mahogany.

INTRODUCTION

Meliaceae, or the Mahogany family, it is so called because of the scented wood .It is a flowering plant family of mostly trees and shrubs in the order Sapindales. Meliaceae are a widely distributed subtropical and tropical angiosperm family occurring in a variety of habitats, from rain forests and mangrove swamps to semi deserts.[1]

Taxonomical classification: The Mahogany family shows Sapindales as order and detailed taxonomical classification if explained in Table no.1 [1, 2] Family Meliaceae (order Sapindales), composed of 575 species in 51 genera of trees and (rarely) shrubs native to tropical and subtropical regions. Trees of the genus Swietenia and Entandrophragma, commonly called mahogany, and of the genus Cedrela (especially the cigar-box cedar, C. odorata) are economically important timber trees. The family Meliaceae composed of 575 species in 50 genera of trees and (rarely) shrubs native to tropical and subtropical region. The Table 2 defines list of so genera's are of prior importance in the family [3].

DISTRIBUTION

It was found that though the Meliaceae are mainly tropical, the eastern Himalayas have several species while in the western Himalayas only one species. In the Nilgiri, Palni and Anaimalai hills no species of the Meliaceae was found above 5000' The natural distribution of these species within the Americas is geographically distinct. *S. mahagoni* grows on the West Indian islands as far north as the Bahamas, the Florida Keys and parts of Florida; *S. humilis* grows in the dry regions of the Pacific coast of Central America from south-western Mexico to Costa Rica; *S. macrophylla* grows in Central America from Yucatan southwards and into South America, extending as far as Peru, Bolivia and extreme western Brazil.[3,4]

MORPHOLOGY

Leaves are characterized by alternate, usually pinnate leaves without stipules. Leaves in spirals, very rarely opposite, usually pinnate; leaflets opposite, sub opposite, or alternate; leaflet blades with base somewhat oblique, margin usually entire or rarely lobed or serrate.

Flowers usually in axillary thyrses, rarely racemose or spicate. Calyx small, 3–6-lobed or with distinct sepals, usually cup-shaped or tubular, imbricate or valvate in bud. Corolla contorted or imbricate, sometimes quincuncial.[5,6] Most species are evergreen, but some are deciduous, either in the dry season or in winter.

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***Inflorescence and seed morphology*:** Flowers are solitary or aggregated in 'inflorescences'; when aggregated, in cymes, or in racemes, or in panicles, or in spikes. The ultimate inflorescence units are cymose (usually, thyrsoid) or racemose. Inflorescences are axillary (usually), or terminal, or leaf-opposed, usually paniculate with cymose branchlets (thyrsoid), less often racemose, fasciculate or spicate, or flowers paired or solitary.[7,8]

***Axial (stem, wood) anatomy*:** Pith is homogeneous, or heterogeneous (often with resin cavities). Secretory cavities may be present, when present, with resin. Cork cambium is present; initially superficial. Nodes are mostly penta-lacunar. Primary vascular tissues are in a cylinder, without separate bundles; collateral. Internal is phloem absent. Cortical and medullary bundles are absent

Fruits are fleshy, or non-fleshy; dehiscent, or indehiscent; a capsule, or a berry, or a drupe, or a nut (rarely). Capsules are septicidal, or loculicidal. Seeds endospermic (rarely), or non-endospermic; with a testa; winged (Swietenioideae), or wingless. Embryo well differentiated. Pollination usually entomophilous; via hymenoptera, or via lepidoptera; mechanism conspicuously specialized (passive pollen presenters, in at least three genera), or unspecialized.[9]

The family Meliaceae stands out because of the common occurrence of limonoids, which possess an- tifeedant, toxic, or growth-reducing properties to different species of insects. Azadirachtin, the most well- known limonoid.[10]

The aim of this project is to carry out a comprehensive review on meliaceae family w.r.t to its species which have good pharmacognostical significance. Also this review aims to help in comparing the therapeutic action of drugs from Genus to Genus within a single family and thus helping in establishing a correlation between different Genus and active constituents present in the same. Following are some example quoted from different genus and different species[5,6].

CHEMISTRY: Twenty-two of the fifty-one genera of the Meliaceae occur in the geographic area under review, and, of these, the chemistry of forty-four species, from nineteen genera, has been investigated. Compounds isolated include limonoids, mono-, di-, sesqui-, and triterpenoids, coumarins, chromones, lignans, flavonoids and other phenolics. Relatively few of the compounds and extracts from these species have been screened for biological activity, probably due to the limited screening facilities available in the area. However, properties including cytotoxicity against tumour cell lines, insect anti-feedant and anti-malarial activity, and uterotonic activity suggest that further extensive biological screening of compounds from this family is warranted. The similar chemistry of the genera Ptaeroxylon and Cedrelopsis support their grouping together in the distinct family Ptaeroxylaceae. Examination of the chemistry of species from this family suggests a close relationship with the Cneoraceae family[7,8,9].

RESULTS AND DISCUSSIONS

Meliaceace family has limonoids and terpenoids as major chemical constituents. Besides this alkalois flavanoids and phenolic compounds are also present in major quantity. While in case of therapeutic actions, the major activity shown by most of the species is cytotoxic activity, antimicrobial activity, insect anti-feedant anti-malarial activity[10,11,12].

CONCLUSION

Present review covers 25 important genus and important species in respective genus. From the context of the present review it is concluded that Meliaceae family has limonoids and terpenoids as major chemical constituents.Besides this,Alkaloids, triterpenes, flavonoids coumarins, chromones, lignans and phenolic compounds are also present[10,20]. Members of Meliaceae provide a variety of medicinal and ornamental values. The major activity shown by most of the species is cytotoxic, antioxidant and insecticidal. Hence it is concluded that species from Meliaceae family are a good source of limonoids and alkaloids.

Table 1: Taxonomical classification

Kingdom	Plantae
Subkingdom	Tracheobionta
Superdivision	Spermatophyta
Division	Magnoliophyta
Class	Mangnoliopsida
Subclass	Rosidae
Order	Sapindales
Family	Meliaceae

Table 2 : List of different genera's of Meliaceae family

Aglaia	Anthocarapa	Aphanamixis
Astrotrichilia	Azadirachta	Cabralea
Calodecarya	Capuronianthus	Carapa
Cedrela	Cedrelopsis	Chisocheton
Chukrasia	Cipadessa	Dysoxylum
Ekebergia	Entandrophragma	Guarea
Heckeldora	Heynea	Humbertioturraea
Khaya	Lansium	Lepidotrichilia
Lovoa	Malleastrum	Melia
Munronia	Naregamia	Neobeguea
Owenia	Pseudobersama	Pseudocarapa
Pseudocedrela	Pterorhachis	Reinwardtiodendron
Ruagea	Sandoricum	Schmardaea
Soymida	Sphaerosacme	Swietenia
Synoum	Toona	Trichilia
Turraea	Turraeanthus	Vavaea
Walsura	Xylocarpus	

Table 3: List of different Genus with a principle species

Sr. No.	Genus	Species	Part used	Chemical constituents	Principle uses
1	Aglaia	*Aglaia rubiginosa*	Twigs and leaves	cabraleone, dammarelonic acid, β-sitosterol glycoside, methyl rocaglate, rocagloic acid	Cytotoxic [5]
2	Aphanamixis	*Aphanamixis polystachya*	Fruits, bark, seeds	aphanamixinin, aphanamixin, aphanamixolin, aphanamixolide, aphananin, aphanamixol, amoorinin, prieurianin, amooranin, βsitosterol, stigmasterol,	Anti-oxidant, Anti-cancer, Insecticidal, Antifeedant, Laxative, Astringent , Rheumatism [6]
3	Azadirachta	*Azadirachta indica*	Entire tree	Nimbidin, Nimbin, Azadirachtin, Gedunin, Margolone	Anti-inflammatory, Antibacterial [7], [8]
4	Carapa	*Carapa guianensis*	Seeds, bark, leaves, fruits	Alkaloid carapinacatechin; sciadopitysin; cleomiscosin B; photogedunin; chisocheton compound F and odoratone.	Skin diseases, febrifuge [9]
5	Cedrela	*Cedrela odorata*	bark	Oleanolic acid, Ursolic acid, Luteolin	Antioxidant [10]
6	Chisocheton	*Chisocheton cumingianus*	seeds	odoratone, grandifoliolenone, chisiamol F, chrysophanol, emodin	Rheumatism, gastralgia and cholera [11]
7	Chukrasia	*Chukrasia tabularis*	Roots, leaves, bark , seeds	Sitosterol, Quercetin, Tannic acid, Tabulalide, Melianone, Chukrasin A,B,C,D,E; Chuktabularin, Tabularisin A-I	Antipyretic, astringent, antidiarrheal and anti-influenza [12]
8	Cipadessa	*Cipadessa baccifera*	Roots, bark, leaves	febrifugin, khayasin T, 2′R-methylbutanoylproceranolide, 2′S-methylbutanoylproceranolide, ruageanin A, swietemahonolide, 2′R-cipadesin A and cipadesin A	Psoriasis, used in treatment of snake poison. [13]

9	Dysoxylum	*Dysoxylum gaudichaudianum*	Leaves and bark	β-sitosterol, polyprenols and triglyceride, tetranortriterpenoid like dysoxylins A−D	Cytotoxic [14]
10	Ekebergia	*Ekebergia capensis*	Roots, leaves	oleanonic acid, ekeberin A ,quercetin-3-O-β-D-glucopyranoside, limonoid, glycoflavonoids	antiplasmodial, antiinflammatory, cytotoxic [15]
11	Entandrophragma	*Entandrophragma cylindricum*	bark	sapelenins G-J, , sapelenins A-D, ekeberin D2 (5), catechin and epicatechin, and anderolide G,	Anti-inflammatory [16]
12	Guarea	*Guarea macrophylla*	Twings and leaves	Hyperin, Isoquercitrin, Kaempferol 7-O-b-D-glucopyranoside, neolignan glucoside (dehydrodiconiferyl alcohol-4-b-D-glucoside)	Antiprotozoal and as an emetic in rheumatism [17]
13	Khaya	*Khaya Senegalensis*	Seeds, leaves, bark	Mexicanolide ; Khayasine, Khivorine, Khayasine, Methyl-6 hydroxyangolensate	Bacterial, used against diabetes, diarrhea and liver disorders [18]
14	Lansium	*Lansium domesticum*	Fruits, seeds, bark.	andirobin derivates, methyl angolensates, exicanolides, an azadiradione, onoceranoids and dukunolides, lansionic acid	In the treatment of Diarrhea, dysentery and malaria [19]
15	Melia	*Melia azedarach*	Roots, fruits, leaves, seeds, bark, flowers	Azadirachitin, Meliantriol, Gedunin	Leprosy, anthelmintic, Antiseptic, diabetes, astringent, Cough and diseases [20]
16	Munronia	*Munronia pinnata*	Whole plant	Alkaloids, flavonoids. saponins, steroid glycosides and tannins	Cytotoxic, antimalarial [21]
17	Naregamia	*Naregamia alata*	Whole plant	reducing sugar, glycosides, flavonoids, tannins and terpenoids, alkaloids, coumarines, saponins except anthraquinones and iridisods	rheumatism, itch, malarial and chronic fevers, wounds, anaemia, enlarged spleen, ulcers,cough, asthma, splenomegaly, scabies, pruritis, dysentery [22]
18	Sandoricum	*Sandoricum koetjape*	Seeds, leaves, bark, fruit	sandoricin and 6-hydroxysandoricin, Bryononic acid and bryonolic acid terpenoids limonoids namely Sandrapins A, B, C, D and E, and sandoripin A and B	anti-feedant activities, anticancer [23]
19	Soymida	*Soymida febrifuga*	Root, leaves, flower, bark	methyl angolensate, luteolin 7-O-glucoside, quercetin, sitosterol, myrecetin	rheumatoid arthritis, asthma, ulcers, anticancer, antimicrobial [24]

20	Swietenia	*Swietenia mahagoni*	Seeds, bark, leaves, roots	linoleic acid, stearic acid, swietenolide, swiemahogins A and B	Anti-oxidant, Antiinflammatory, Hypoglcemic [25]
21	Toona	*Toona ciliate*	Bark, flower, gum	Cedrelone, sesquiterpene, cycloartene stigmasterol, campesterol, apotirucallene, tirucallene, catechin, siderin	Emmenagogue, astringent, tonic, expectorant,anthelmintic, cardiotonic. [26]
22	Trichilia	*Trichilia hirta*	Leaves, bark, roots	Hirtinone, nilocitin, dihydronilocitin B, melianone lactone, hirtin	Anticancer, skin ulcer and emetic [27]
23	Turraeanthus	*Turraeanthus africanus*	Bark, leaves, seeds	Limonoids, steroids, triterpenoids, saponins turraeanthinC, sesamin, stigmasterol	Cytotoxicity [15,27]
24	Walsura	*Walsura trifoliata*	Bark, leaves	`apo-tirucallane triterpenoids, piscidinone A and B alkaloids, carboxylic acids, fatty acids, phenols, saponins and steroids	Antimicrobial, antifungal [19]
25	Xylocarpus	*Xylocarpus granatum*	Fruits, seeds and bark	alkaloids viz. N-methyl flindersine, chelerythrine, acetonyl, xylogranatinin, granatoin, Flavonoids like catechin, epicathechin, kaempferol,	Diarrhea, hyperglycaemia, Dyslipidemia [20]

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